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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/584,448

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Junko Makita

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EXAMINER

TEJANO, DWIGHT ALEX C

ART UNIT

PAPER NUMBER

2622

NOTIFICATION DATE

DELIVERY MODE

10/16/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No. 10/584,448	Applicant(s) MAKITA ET AL.	
	Examiner Dwight Alex C. Tejano	Art Unit 2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 June 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-40 is/are pending in the application.
- 4a) Of the above claim(s) 35 and 40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-26, 33, 34, 38 and 39 is/are rejected.
- 7) ☒ Claim(s) 27-32, 36 and 37 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 June 2006 & 15 Feb 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Claims 35 and 40 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 25 June 2009.

Response to Arguments

Applicant's arguments with respect to claims 21 – 26 **have been considered but are moot** in view of the new ground(s) of rejection.

Claim Objections

Claims 31, 32, and 36 – 39 are objected to because of the following informalities:

- Claims 31, 32: The instances of the word “obtains” should be “obtain.”
- Claims 36 - 39: The preambles all refer back to the apparatus according to claims 24 and 25, respectively. However, claims 24 and 25 do not claim an apparatus, but rather a signal processing method.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 24, 25, 38, and 39 are rejected under 35 U.S.C. 102(e) as being anticipated by Zhang, et al. (US 20040086177 A1.)

Regarding **claim 24**, Zhang, et al. (hereafter, "Zhang") discloses a pixel signal processing method (Fig. 8) that, given a group of pixel signals from pixels (25) arrayed on a two-dimensional plane (sensor, 20), each pixel having one of a first to an N-th spectral characteristic (RGB [0005]), generates a pixel signal having an L-th spectral characteristic at a pixel position of interest where there is a pixel signal having a K-th spectral characteristic (K and L being different integers between 1 and N, inclusive), comprising (output demosaic, 890):

- selecting one of the arrayed pixels for the pixel position of interest (inherent, as illustrated in that specific green pixel positions are "selected", [0059]);
- applying low-pass filtering (Gaussian convolution, which effectively low-pass filters image, [0063]) to a plurality of pixel positions in an area

neighboring the pixel position of interest (blurred version of regions, 830) according to the K-th spectral characteristic and the L-th spectral characteristic;

- performing a regression analysis in the plurality of pixel positions in the area neighboring the pixel position of interest (calculate regression coefficients, 850), using the pixel signals or the low-pass filtered outputs (from blurred versions of regions, which only contain high frequency components, [0064]) having the K-th spectral characteristic as an explanatory variable, and using the pixel signals or the low-pass filtered outputs having the L-th spectral characteristic as a purpose variable, to calculate a regression line, $y = ax + b$ [equation, 0054] ('y' being the pixel signal having the L-th spectral characteristic, 'x' being the pixel signals having the K-th spectral characteristic, 'a' and 'b' being constants representing the slope and intercept of the regression line) [0054,]

• expressing a correlation of the pixel signals having the K-th spectral characteristic with the pixel signals having the L-th spectral characteristic (Fig. 2) [0057]; and

• determining the pixel signal having the L-th spectral characteristic at the pixel position of interest by applying a conversion formula based on the regression line to the pixel signal having the K-th spectral characteristic at the pixel position of interest [0057];

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- wherein the selecting step sequentially selects different ones of the arrayed pixels for the pixel position of interest and, for each selected pixel position of interest, applying the steps of performing the regression analysis and determining the pixel signal having the L-th spectral characteristic [process is repeated for all others, 0061.]

Regarding **claim 25**, Zhang discloses the limitations of claim 24 and further that the pixel signals (raw sensor values, 30) are associated with an imaging device (sensor, 20) with N types (Bayer filter, [0005]) of photoelectric conversion elements (pixels, 25), each having one of the first to N-th spectral characteristics [0005], arrayed on a two-dimensional plane, wherein the method further comprises determining the K-th and L-th spectral characteristics in order of the strength of the correlation between their spectral characteristics [yielding highest correlation is selected, 0059.]

Regarding **claim 38**, Zhang meets the limitations of claim 25. Furthermore, Zhang discloses that low-pass filtering (Gaussian convolution) is performed on an output of the imaging device (sensor, 20.) Specifically, the Gaussian convolution is performed on the raw image data, which constitutes low-pass filtering on the output data from the imaging device [0063.]

Regarding **claim 39**, Zhang satisfies the limitations of claim 25. Additionally, the regression analysis must inherently use the pixel signals output from the imaging device

as the pixel signals having the K-th spectral characteristic on account of the fact that there are no other sources for pixel signal data for the process to analyze.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 21, 22, 23, 26, 33, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang.

Regarding **claim 21**, Zhang discloses a pixel signal processing apparatus (Fig. 3) that, given a group of pixel signals (raw sensor values, 30) from pixels (25) arrayed on a two-dimensional plane (sensor, 20), each pixel having one of a first to an N-th spectral characteristic [0005], generates a pixel signal having an L-th spectral characteristic at a pixel position of interest where there is a pixel signal having a K-th spectral characteristic (K and L being different integers between 1 and N, inclusive.)

Additionally, Zhang discloses a regression analysis device and calculating device (processor, 40, with LLR algorithm, 45) that performs the regression calculations and conversion calculations as required by the claim.

However, Zhang fails to specifically disclose a selector for selecting a pixel and a low-pass filter corresponding to the different spectral characteristics.

Despite this, the Examiner maintains that it would have been obvious to include such things, given the nature of Zhang's system.

First, because Zhang discloses the selections of pixels to perform regression on or to divide into regions, it would be obvious to include a selector, as it is necessary to be able to even perform this step.

Additionally, Zhang discloses a software method of retrieving a low-pass filtered version of the image (using Gaussian convolution.) Because Zhang discloses that this filtered image is preferable in order to be able to extract the high frequency components of the image, it would have further been obvious to anyone of ordinary skill in the art that this step could alternatively be performed by hardware instead of software. This is mainly a design choice (additional software processing time vs. additional hardware components,) as the ultimate effect is, predictably, the same in either case.

Therefore, it would be obvious to include the selector and the low-pass filter to Zhang's system, as the selector is necessary for the method in Zhang to perform properly and the hardware based low-pass filters would eliminate the processing time caused by the Gaussian convolution.

Regarding **claim 22**, Zhang renders the apparatus of claim 21 obvious. Furthermore, because the selector is obviously necessary on account of the method as required by Zhang, it would further be obvious that the selector must also determine the spectral characteristics in order of strength, as, again, the method of Zhang requires it.

Because Zhang discloses a selection based on determination of correlation strength, the selector must obviously have the same properties.

Therefore, it would be obvious that the selector determines the characteristics in order of strength of the correlation, as the method in Zhang requires this component in order for it perform the corresponding process [0059.]

Claims 33 and 34 are apparatus variants of claims 38 and 39, respectively. They are thus rendered obvious for the same rationale as in the rejection to claim 22 (i.e., apparatus is rendered obvious as being required to perform the disclosed method).

Regarding **claim 26**, Zhang discloses the process of claim 25, as discussed above. Additionally, Zhang discloses that the imaging device has one of red, green, and blue spectral characteristics [0005.]

However, Zhang fails to disclose the selection means as determining the specific order as claimed of pixel signals for comparison (specifically, G-R, G-B, R-G, B-G, B-R, R-B.) Despite this, such a practice is obvious to one of ordinary skill, as this process is mainly a design choice as to what to process first.

Zhang discloses in [0054] by example that the G-R and G-B relationships are evaluated first; that is, determining the placement of the missing R and B values in a selected G pixel. Further, Zhang discloses that the "similar estimations can be applied for all missing R and G values at the B pixel locations" and further for the R locations.

Because the process is evaluated with respect to each pixel individually (i.e., the neighborhood for one pixel is not the same as the neighborhood for another pixel) and is done with every color relationship (R-G, R-B, B-G) with separate linear regression analyses, the outcome of one evaluation would not change the outcome of another evaluation. As such, the color relationships can be evaluated in any order in the process without changing the outcome of each evaluation.

Therefore, the claimed process would have been obvious to one of ordinary skill in the art because the particular process is immaterial compared to the evaluation of another pair of pixel signals and, as such, was recognized as part of the ordinary capabilities with highly predictable results of one skilled in the art.

Regarding **claim 23**, Zhang renders the apparatus of claim 21 obvious. In a similar fashion, the apparatus of claim 23 is rendered obvious in that, because the analogous process (claim 26) is rendered obvious by Zhang, the apparatus that is necessary to perform the process is also obvious in view of Zhang.

Therefore, this apparatus variation is rendered obvious, as the apparatus components are necessary to perform the process of claim 26, as rendered obvious for the rationale as previously presented.

Allowable Subject Matter

Claims 27 – 32, 36, and 37 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record fails to disclose or reasonably suggest the limitations of the above claims. Specifically, the prior art of record fails to specifically disclose or reasonably suggest the determination processes as required by claims 27 and variant claim 29 and the specific low-pass filter limitations required by claims 28 – 32, 36, and 37. In these cases, while a selector and a low-pass filter are themselves rendered obvious, as discussed above, these limitations are otherwise unique.

Citation of Pertinent Art

The prior art made of record is considered pertinent to the applicant's disclosure, but is not relied upon as a reference for the preceding sections:

- Jones (US 20020163583 A1) discloses a camera with demosaicing properties in order to increase dynamic range.
- Watanabe (US 20030227552 A1) discloses an imaging device that divides into pixel neighborhoods and interpolates accordingly.
- Baharav, et al. (US 20040201721 A1) discloses a system for demosaicing and resizing images.
- Keshet, et al. (US 20050134713 A1) discloses a method for interpolating color values in a pixel neighborhood.

- Kondo, et al. (US 20050200723 A1) discloses an image processing apparatus that performs ADRC processes in pixel demosaicing.
- Sasai (US 6654492 B1) discloses an image processing apparatus that has an interpolation unit and has an average of values in a neighborhood of pixels.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dwight Alex C. Tejano whose telephone number is (571) 270-7200. The examiner can normally be reached on Monday through Friday 10:00-6:00 with alternate Fridays off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lin Ye/
Supervisory Patent Examiner, Art Unit 2622

/Dwight Alex C Tezano/
Examiner, Art Unit 2622